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(57) Abstract :

The present invention discloses an IoT-enabled sensor network for offshore large-scale recirculating aquaculture systems and method thereof, comprising a plurality of distributed sensing units configured to measure water quality parameters including dissolved oxygen, pH, temperature, salinity, turbidity, ammonia concentration, and nitrate concentration. Each sensing unit is operatively coupled to a processing unit configured to perform signal conditioning, data conversion, filtering, normalization, and feature extraction. The system further comprises communication units configured to establish a mesh network for short-range transmission and a gateway unit for long-range communication with a remote computing system. A structural enclosure device fabricated from corrosion-resistant material houses at least one processing unit, communication unit, and power unit, wherein the power unit includes rechargeable energy storage and renewable energy harvesting arrangements. A control unit is configured to analyze aggregated data and generate control signals for actuating aquaculture equipment including aeration devices, pumps, filtration assemblies, and feeding systems.

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